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EXAMINER

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte JOHANNES RUOFF, JENS TIMO NEUMANN,
JOERG ZIMMERMANN, DIRK HELLWEG, and
DIRK JUERGENS¹

Appeal 2015-003444
Application 13/792,599
Technology Center 2800

Before JUSTIN BUSCH, DANIEL N. FISHMAN, and
JAMES W. DEJMEK, *Administrative Patent Judges*.

FISHMAN, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134(a) from a Final Rejection of claims 1–20. We heard oral argument February 13, 2017. A transcript of that hearing has been entered in the file history. We have jurisdiction over the pending claims under 35 U.S.C. § 6(b).

We reverse.

¹ According to Appellants, the real party in interest is Carl Zeiss SMT GmbH. *See* App. Br. 1.

THE INVENTION

Appellants' invention is generally directed to a microlithographic projection exposure apparatus and methods of operating same that reduces image placement errors ("IPE") therein. *See Spec. 1:2–4.* More specifically, image placement errors associated with a projected image on a light sensitive surface are determined and an input state of polarization of the projected light is changed to an elliptical output state of polarization to reduce the sensed image placement error. *See Spec. Abstract.*

Independent claim 1, reproduced below, is illustrative with disputed limitations in *italics*:

1. An optical system of a microlithographic projection exposure apparatus, the optical system comprising:

a) a polarization adjustment device which is capable of changing an input state of polarization to different elliptical output states of polarization, and

b) a control unit which controls the polarization adjustment device, wherein the control unit is configured:

to receive data relating to image placement errors occurring at a light sensitive surface on which features contained in a mask are imaged, and

to select the elliptical output state of polarization produced by the polarization adjustment device such that the image placement errors are reduced,

wherein the image placement errors comprise absolute lateral displacements of an actual feature image from its ideal placement.

THE REJECTIONS

Claims 1–7 and 10–20 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Takeuchi et al. (US 2007/0188730 A1; pub.

Aug. 16, 2007) (“Takeuchi”) and Van Dam et al. (US 2006/0192149 A1; pub. Aug. 31, 2006) (“Van Dam”). Final Act. 2–9.

Claims 8 and 9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Takeuchi, Van Dam, and Kaise et al. (US 2008/0043236 A1; pub. Feb. 21, 2008) (“Kaise”). Final Act. 9–10.

ISSUE

The dispositive issue raised by Appellants’ arguments is: Has the Examiner erred by finding the combination of Takeuchi and Van Dam teaches or suggests the disputed limitations of independent claim 1 and similar recitations of independent claim 11?

ANALYSIS

The Examiner finds Takeuchi discloses selecting an output state of polarization to reduce image placement errors. Final Act. 3 (citing Takeuchi ¶ 82). The Examiner further finds, “Takeuchi et al. does not explicitly teach wherein the different output states of polarization are elliptical and wherein image placement errors comprise absolute lateral displacements of an actual feature image from its ideal placement.” *Id.* The Examiner then finds Van Dam, in combination with Takeuchi, discloses these features absent in Takeuchi and articulates a reason for the combination. *Id.* at 4 (citing Van Dam, Figs. 1, 6, ¶¶ 18, 64–66).

The Examiner explains Van Dam, in the proposed combination, discloses using “an elliptical polarization state of the light which also allows for control of the contrast of an image or other parameters of an image such as the CD and a CD-pitch dependency [] wherein a parameter of the image is

enhanced with the control of the intensity of the preferred stated of polarization of the radiation beam.” Ans. 3 (citing Van Dam ¶¶ 18, 64). The Examiner finds, based on Appellants’ Specification, “one would understand that the claimed absolute lateral displacements of an actual feature image from its ideal placement is directly affected by the intensity distribution and the size, orientation and pitch of the features to be imaged.” *Id.* at 3–4 (citing Spec. Fig. 3, 12:8–13:4). The Examiner further explains adjusting radiation intensity by modifying polarization of the radiation source, in Van Dam, “translates into, for example, image contrast capabilities so as to manipulate CD-pitch behavior” and, therefore, “discloses correcting for imaging errors which also includes reducing absolute lateral displacements of an actual feature image from its ideal placement.” *Id.* at 5 (citing Van Dam ¶¶ 15, 16, 64–67).

Appellants argue the Examiner misunderstands “intensity distribution” as recited in Appellants’ Specification, erroneously equating the term with factors that contribute to placement errors. *See* Reply Br. 1–2. Appellants further argue, although the Examiner relies on the combined references to disclose “control of the contrast of an image, and other parameters such as critical dimension (CD), a CD-pitch dependency and linewidth,” the Examiner fails to explain “how these parameters relate to the claimed absolute lateral displacements of an actual feature image from its ideal placement.” *Id.* at 2.

We are persuaded the Examiner erred. Initially, we note the Examiner’s finding (Final Act. 3) that Takeuchi paragraph 82 discloses adjusting polarization “such that the image placement errors are reduced” is clearly erroneous. Although Takeuchi discloses adjustments to the radiation

source polarization, the Examiner has not identified disclosure in Takeuchi's paragraph 82 (or elsewhere in Takeuchi that we can discern) that polarization adjustments achieve a reduction in image placement error.

Regarding the combined disclosures of Takeuchi and Van Dam, we find no basis for the Examiner's finding (Ans. 5) that adjustments to critical dimension ("CD"), CD-pitch, or image contrast also teaches or suggests the ability to reduce image placement errors. Although Van Dam refers to CD and CD-pitch as *examples* of image parameters that may be adjusted by modifying polarization of the radiation (*see* Van Dam ¶ 64), we find no suggestion in the references that image placement errors comprising "absolute lateral displacements of an actual feature image from its ideal placement" are similarly adjustable by modifying radiation polarization. The Examiner's argument is based on an incorrect interpretation of the recitation in Appellants' Specification that "the IPE depends on the size, orientation and pitch of the features to be imaged, and sometimes also on the location where the features are positioned on the mask." Ans. 3 (quoting Spec. 13:1–2). The quote, read in context with Figure 1 and its related description, refers to "features 19 to be imaged." This is a reference to the features 19 on mask 16—not "image placement errors occurring at a light sensitive surface" for features as they are projected at the light sensitive surface. *See* Spec. 10:9–22, Fig. 1 (element 22).

For the above reasons, we are persuaded the Examiner erred in rejecting independent claims 1 and 11 and, therefore, also erred in rejecting all claims depending therefrom. Appellants raise additional issues in the Briefs. However, because we are persuaded of error with regard to the

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identified issue discussed *supra*, which is dispositive as to the rejection of all claims, we do not reach the additional issues raised by Appellants.

DECISION

We reverse the Examiner's decision to reject claims 1–20.

REVERSED